

Forest Sector Outlook Study 2017-2040



UNECE



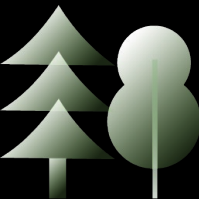
Food and Agriculture Organization
of the United Nations

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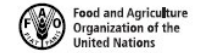
Joint Working Party on Forest Statistics, Economics and Management

1-3 June 2022



Overview

- ❑ The 2021 **Forest Sector Outlook Study** is another in a series completed every 5-10 years
- ❑ Led by the **UNECE/FAO Timber Section** in Geneva
- ❑ Covering
 - ❑ Europe
 - ❑ United States and Canada
 - ❑ Russian Federation
 - ❑ Eastern Europe, Caucasus and Central Asia (EECCA)
 - ❑ (Rest of the World)
- ❑ Projections 2017-2040



UNECE

FOREST SECTOR OUTLOOK STUDY 2020-2040



UNITED NATIONS
Geneva, 2021

Overview continued

	UNECE Region	Percent of World
Population ^a	1.29 billion	17
GDP ^a	PPP\$ 46 trillion	52
Forest area ^b	1.71 billion ha	41
Forest growing stock ^b	206 billion m ³	37
Timber (IRW) production ^c	1,171 million m ³	58
Sawnwood production ^c	297 million m ³	63
Wood-based panels production ^c	136 million m ³	38
Fiber furnish production ^c	223 million MT	53
Paper & Paperboard Production ^c	181 million MT	45



Context



FSOS is not a forecast, but a tool for evidence-based policy making



Through scenario analysis and literature review, it offers the possibility for stakeholders to evaluate the long-term consequences of policy choices

Structure

Three Reference Projections:

- **SSP2: Middle of the Road (Business As Usual)**
- **SSP3: Regional Rivalry**
 - low economic growth, high population growth
- **SSP5: Fossil-Fueled Future**
 - high economic growth, lower population growth

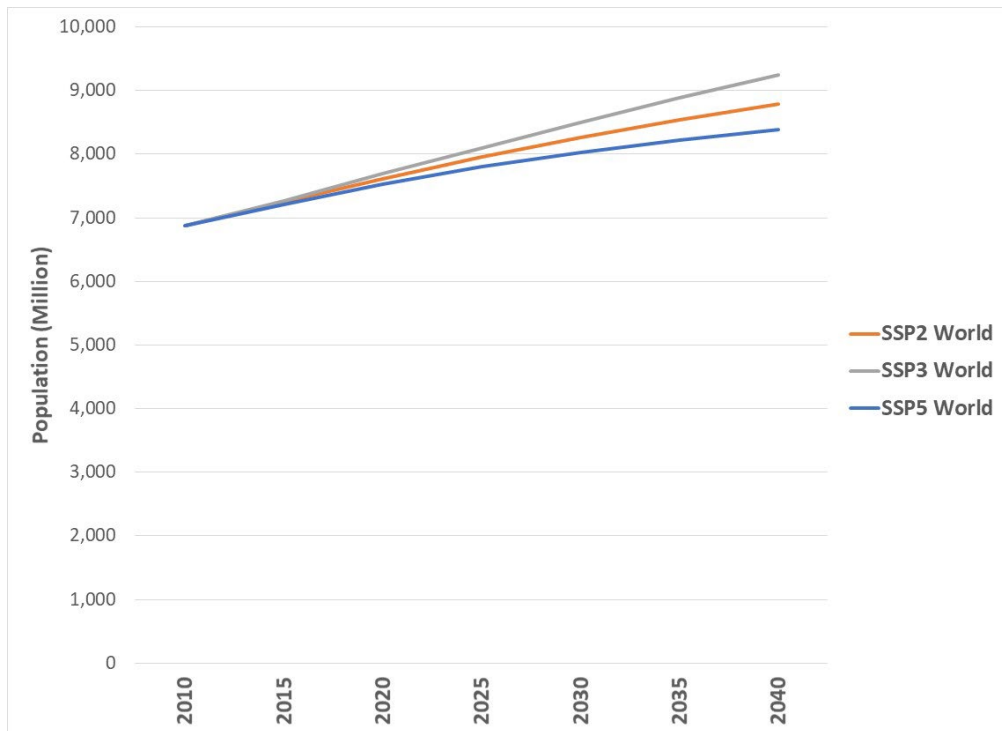
Six What-If Alternative Scenarios:

- **Three Structural Changes in Timber (Wood) Demand**
- **Three Structural Changes in Timber Supply**

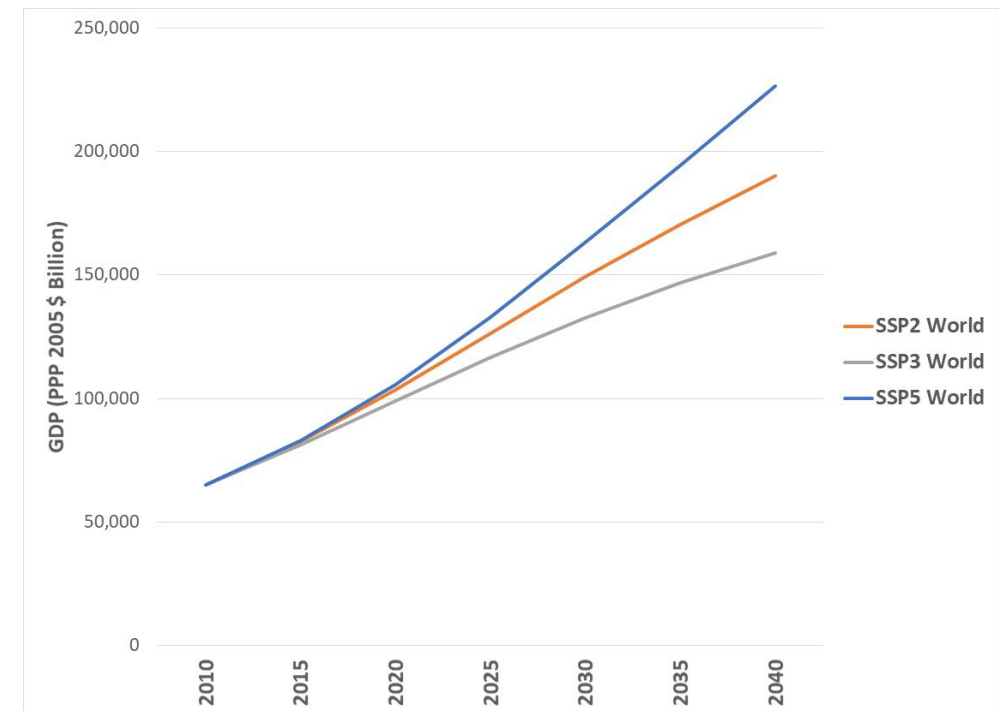
Two Special Issues:

- **How would significant trade restrictions affect forest product markets in the UNECE?**
- **How will the UNECE be affected by Climate Change?**

Shared Socioeconomic Pathways (SSPs)



World Population



World GDP

Special Issues

Trade Barrier Increases

- ❑ Examined quantitative scenarios of limited and global rises in tariffs

Climate impacts

- ❑ Qualitatively examined effects of changing rates of disturbances
- ❑ Qualitatively examined management strategies to mitigate and adapt to climate change
- ❑ Quantitatively examined effects of temperature increases, precipitation changes, and CO₂ fertilization, on:
 - Carbon – forest, harvested wood products
 - Markets

Please refer to the Outlook report for in-depth discussion of these results

Quantitative Modeling Setup

- New Version of the Global Forest Products Model (GFPM)
- GFPM Updated to Include:
 - Planted Forest Projections
 - Climate Projections
- Harvested Wood Products Carbon and Forest Carbon Tracked
- Generally, we compare one of our three reference scenarios with an alternate scenario built from the same SSP
 - Most: Reference SSP2 versus SSP2 with a structural change assumed
 - Climate only: Reference SSP5 versus SSP5 with strong warming

Structural Changes in Demand

1

Increase wood-based construction in China:

- ❑ This is an external (to UNECE) demand increase for structural wood
- ❑ 10% of houses in China made with wood frame construction by 2040

2

Increase wood use in construction in Europe:

- ❑ This is an internal UNECE demand increase for structural wood
- ❑ To a rate matching 2017 US per capita lumber and panel consumption

3

Increase production of wood-based textiles:

- ❑ This is a global demand increase for fibre (competing with paper pulp)
- ❑ Wood fibre replaces 30% of global textile industry fibre needs by 2040

China High Wood Consumption

Results: Compared 2040 Outcome with the SSP2 Reference Case

- ❑ Price impacts felt in the Russian Federation, China, and globally, but not appreciably elsewhere in the UNECE
- ❑ Prices for IRW up 21% in China, 8% in Russia, up by 5 to 10% in Russia, China, and globally for products, not significantly elsewhere in the UNECE
- ❑ Production up by double digit percentages for most wood products, not paper (slight decline)

Europe High Wood Consumption

Results: Compared 2040 Outcome with the SSP2 Reference Case

- Price impacts felt in the Russian Federation and globally, but not appreciably elsewhere in the UNECE
- Prices for IRW up 2% in Russia, 4% globally
- Product prices up by less than 2% in Russia and globally.
- Production is up in the UNECE overall in wood products, down in paper overall and globally.

Textile High Wood Fiber Consumption

Results: Compared 2040 Outcome with the SSP2 Reference Case

- ❑ Price impacts felt in the Russian Federation and globally, but not appreciably elsewhere in the UNECE
- ❑ Prices for IRW up 2% in Russia, 3% globally; product prices up by less than 2% in Russia and globally.
- ❑ Production is up for roundwood, down for sawnwood by less than 1% globally, though impacts are larger in the UNECE (-6 to -15%).
- ❑ Note: We did not directly model the paper sector impacts, though one would presume them to be negative.

Structural Changes in Supply

Increase global forest area
by 10%

Increase planted forests
outside the ECE Region

High global warming and
associated CO₂ rise (RCP 8.5)

High Global Forest Area

Results: Compared 2040 Outcome with the SSP2 Reference Case

- ❑ Impacts felt in the Russian Federation and globally, but not appreciably elsewhere in the UNECE
- ❑ Prices for IRW down 3% and for products by -0.5 to -1.7% overall globally
- ❑ Production up by low single digit percentages

Climate Change Impacts (Quantitative)

Results: Compared 2040 Outcome with the SSP2 Reference Case

- ❑ IRW prices fall globally due to overall larger timber supply, although drops are 3% globally and range from about -2% to -6%
- ❑ Product prices drop by less than that, most for sawnwood (-2 to -4%), panels (-1%) and papers (-1%)

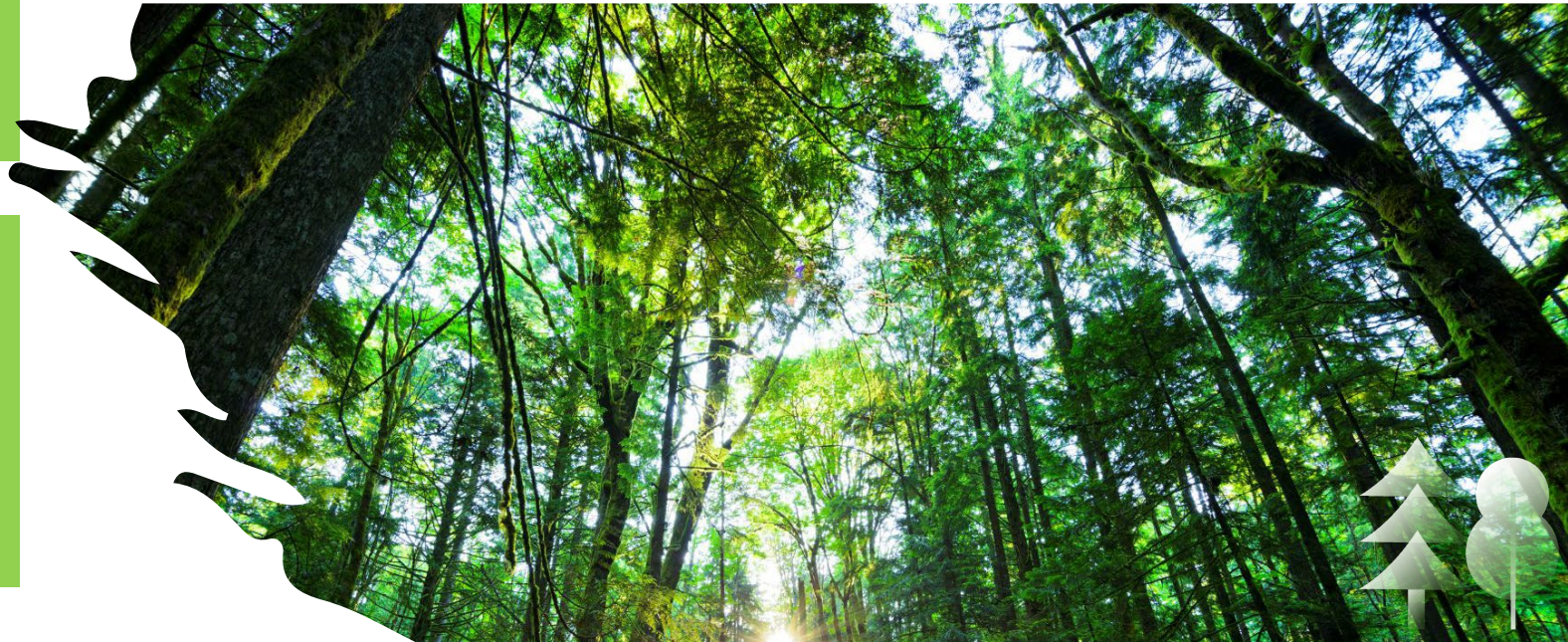
Conclusions

- ❑ Rising demand for wood outside of the UNECE would drive up prices and increase net exports from the UNECE region, but stocks continue rising into the future
- ❑ The paper sector sees limited prospects due to declining demand for graphics paper, but sustained GDP growth means more demand for other paper
- ❑ New demand for wood fiber by the textiles sector would drive up prices, but its effects would be small overall under the scenario we considered
- ❑ Effects of climate change will differ by country and region of the world
 - Using one projection, we found that certain countries benefit or are harmed more than others
 - Effects are small by 2040, would increase with time
 - Our analyses ignore effects of climate change on forest disturbances besides wildfire

Thank You

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Tables of What-If Scenario Results

Increase Wood-based Construction in China

	Production	Consumption	Net exports	Price¹	Forest growing stock
	<i>million cubic metres</i>	<i>million cubic metres</i>	<i>million cubic metres</i>	<i>\$/cubic metres</i>	<i>million cubic metres</i>
Industrial roundwood					
UNECE region	126.4	98.1	28.3	na	-512.3
China	96.4	146.2	-49.8	26.6	-1712.2
World	270.7	270.7	0	10.2	-2439.2
Sawnwood					
UNECE region	51.3	-4.6	55.9	na	
China	30.4	103.9	-73.5	22.7	
World	96.8	96.8	0	22.7	
Panels²					
UNECE region	2.5	-3.8	6.3	na	
China	118.8	128.6	-9.8	29.3	
World	123.0	123.0	0	13.8	
Paper & paperboard³					
	<i>million tonnes</i>	<i>million tonnes</i>	<i>million tonnes</i>	<i>\$/tonne</i>	
UNECE region	-0.6	-1.2	0.6	na	
China	-0.5	-0.6	0.1	1.9	
World	-2.6	-2.6	0	8.1	

GFPM projected differences in the production, consumption, net exports, prices of wood products, and forest growing stock by 2040 (projected values in 2040 in China-High Wood Consumption scenario minus reference projected values)

Increase Wood Use in Construction in Europe

Commodity	Region	Production	Consumption	Net Export	Price	Forest Growing Stock
Unit	<i>million m³</i>	<i>million m³</i>	<i>million m³</i>	<i>million m³</i>	<i>US \$/m³</i>	<i>billion m³</i>
Industrial roundwood	Europe-EU	22.1	46.3	-24.2	na	-262.7
	Russian Federation	6.5	-19.7	26.2	1.9	-103.9
	North America	20.6	19.1	1.6	na	-175
	UNECE	53.6	52.7	0.9	na	-580.5
	World	90.4	90.4	0	3.9	-924.3
Sawnwood	Europe-EU	28.2	56.0	-27.9	na	
	Russian Federation	-9.6	5.9	-15.6	4.9	
	North America	8.2	-0.8	9.1	na	
	UNECE	31.9	65.9	-34.0	na	
	World	63.9	63.9	0	4.8	
Panels	Europe-EU	8.2	14.5	-6.3	na	
	Russian Federation	1.6	2.6	-1	3.8	
	North America	4.3	0.3	4	na	
	UNECE	15.6	19.5	-3.9	na	
	World	16.2	16.2	0	4.7	
Paper and paperboard	Europe-EU	-0.8	-0.3	-0.5	na	
	Russian Federation	-0.2	0	-0.1	4.7	
	North America	-0.2	-0.2	0.1	na	
	UNECE	-1.2	-1.2	-0.6	na	
	World	-1.3	-1.3	0	3.4	

GFPMP projected differences in the production, consumption, net exports, prices of wood products, and forest growing stock by 2040

Increase Production of Wood-based Textiles

Commodity	Region	Production	Consumption	Net Export	Price	Forest Growing Stock
Unit	million m ³	million m ³	million m ³	million m ³	US \$/m ³	billion m ³
Industrial roundwood	Europe-EU	13.5	18.1	-4.6	na	-144.9
	Russian Federation	5.3	-11.5	16.9	1.6	-56.1
	North America	28.8	28	0.8	na	-260.4
	UNECE	50.9	40.8	10.1	na	-484.5
	World	81.4	81.4	0	3.1	-768.3
Sawnwood	Europe-EU	-10.4	-0.6	-9.8	na	
	Russian Federation	-7.3	-0.1	-7.2	4	
	North America	-11	-1	-9.9	na	
	UNECE	-26.4	-1.9	-24.5	na	
	World	-3.5	-3.5	0	3.9	
Panels	Europe-EU	-1.3	-0.5	-0.8	na	
	Russian Federation	-0.1	-0.1	0	3.0	
	North America	-1.3	-0.5	-0.8	na	
	UNECE	-2	-1.3	-0.6	na	
	World	-3.9	-3.9	0	3.4	
Paper and paperboard	Europe-EU	-0.9	9.8	2	na	
	Russian Federation	-0.2	-0.3	1.8	49.4	
	North America	7.8	16.2	11.6	na	
	UNECE	6.1	24.8	18	na	
	World	1.2	51.5	0	83.4	

GfPM projected differences in the production, consumption, net exports, prices of wood products, and forest growing stock by 2040



Food and Agriculture Organization of the United Nations



Increase Global Forest Area by 10%

Commodity	Region	Production	Consumption	Net Export	Price	Forest Growing Stock
Unit	<i>million m³</i>	<i>million m³</i>	<i>million m³</i>	<i>million m³</i>	<i>US \$/m³</i>	<i>billion m³</i>
Industrial roundwood	Europe-EU	9.4	12.4	-3	na	4153
	Russian Federation	6.7	10.7	-4	-1.9	8673
	North America	7.4	18.2	-10.9	na	9578
	UNECE	23.9	40.6	-16.7	na	23852
	World	39.7	39.7	0	-3.6	56544
Sawnwood	Europe-EU	2.1	0.8	1.3	na	
	Russian Federation	4.7	0.1	4.6	-4.6	
	North America	9.4	0.9	8.5	na	
	UNECE	14.9	2	12.9	na	
	World	4.3	4.3	0	-4.7	
Panels	Europe-EU	2.2	0.8	1.4	na	
	Russian Federation	0	0.1	-0.1	-3.7	
	North America	-0.7	0.6	-1.2	na	
	UNECE	1.9	1.8	0.1	na	
	World	4.9	4.9	0	-4.3	
Paper and paperboard	Europe-EU	-0.3	0.3	-0.7	na	
	Russian Federation	0.1	0	0	-4	
	North America	0.6	0.3	0.2	na	
	UNECE	0.3	0.7	-0.5	na	
	World	1.6	1.6	0	-4.1	

GfPM projected differences in the production, consumption, net exports, prices of wood products, and forest growing stock by 2040

Climate Change Impacts (Quantitative)

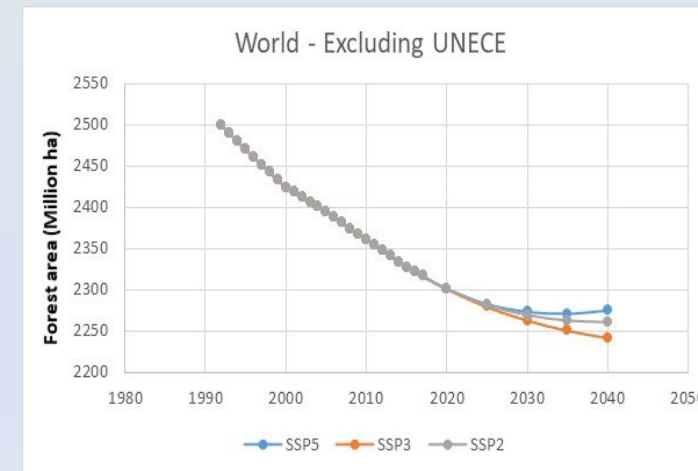
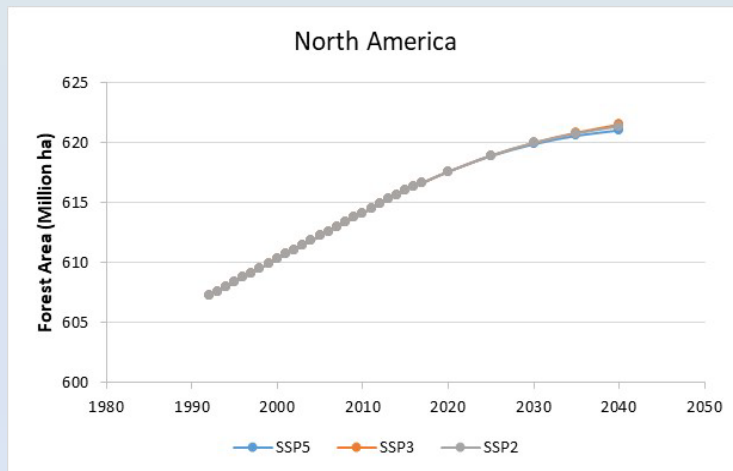
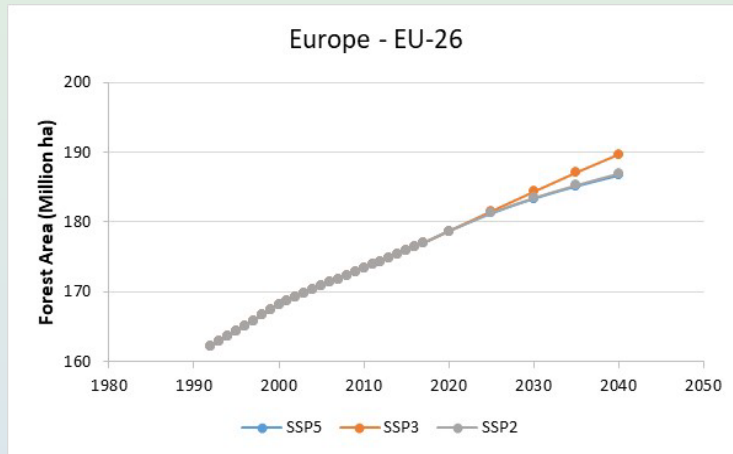
Region	Projected NPP values	Price of Industrial Roundwood	Production of Industrial Roundwood	Consumption of Sawnwood
Canada	7	-4.4	3.2	1.6
E. Europe & C. Asia	-1	na	-5.4	0.6
Russian Federation	3	-2.7	0.1	1.1
USA	15	-6.1	11.5	1.7
W. Europe	1	-1.6 to -3.6	-1.7	0.7
World	na	-2.9	2.7	1

Projected percentage differences in 2040 between scenario with forest productivity change driven by Representative Concentration Pathways 8.5 and scenario based on SSP5 without climate change effects, selected regions/countries and parameters (%)

Reference Scenario Results

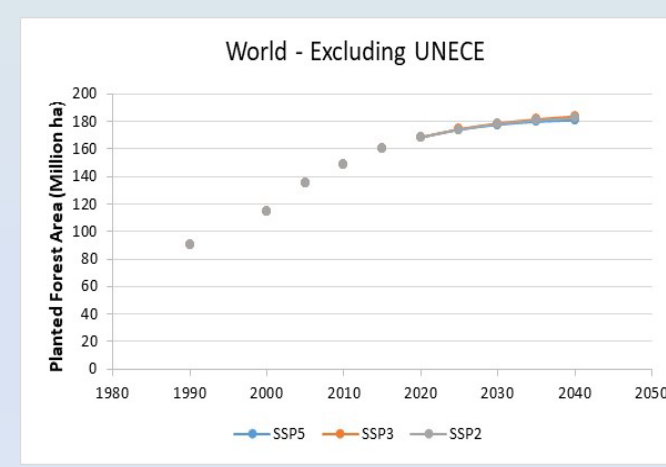
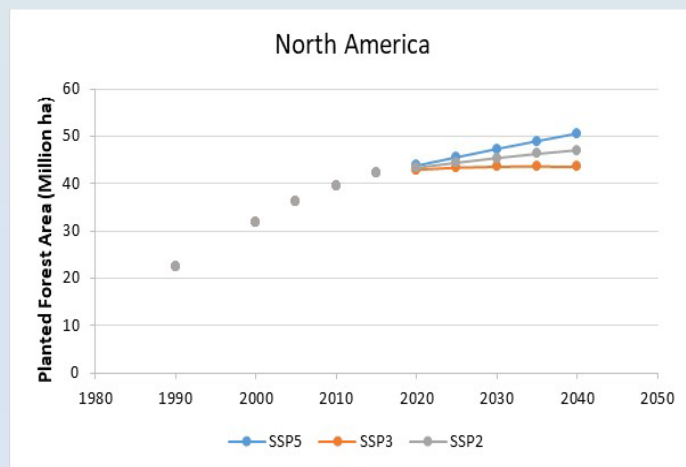
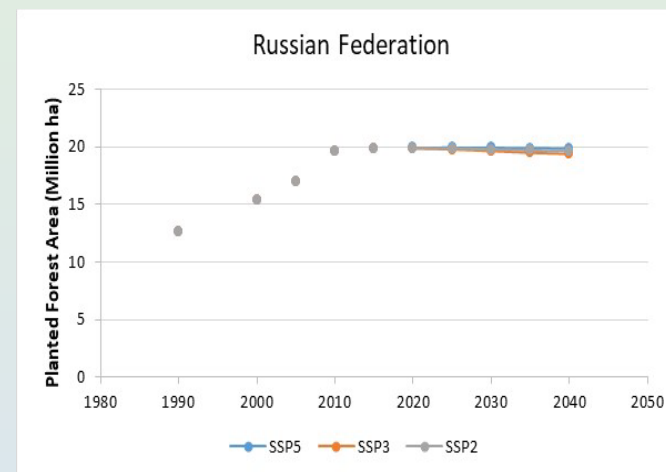
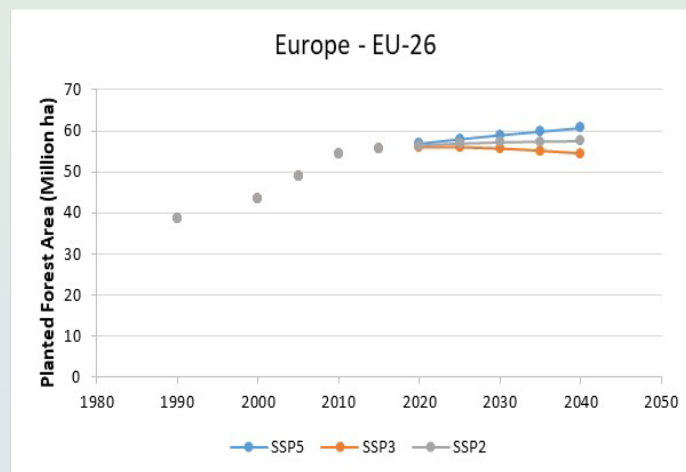
RESULTS: SSPs Total Forest Area

Historic and projected **total forest area**, 1990-2040



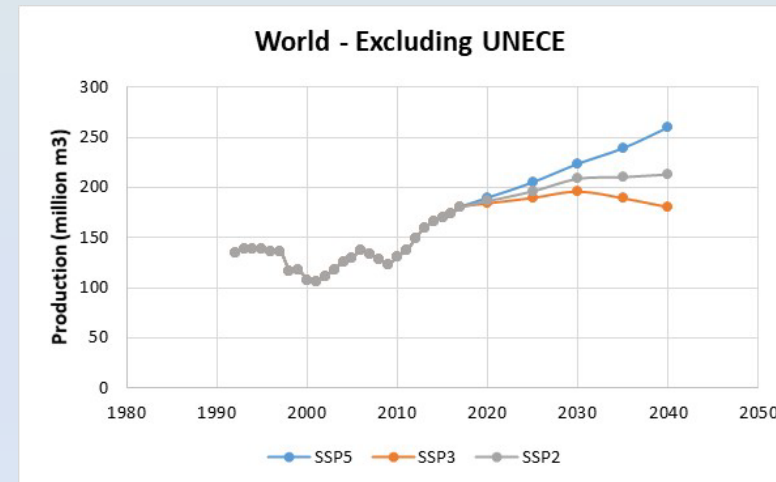
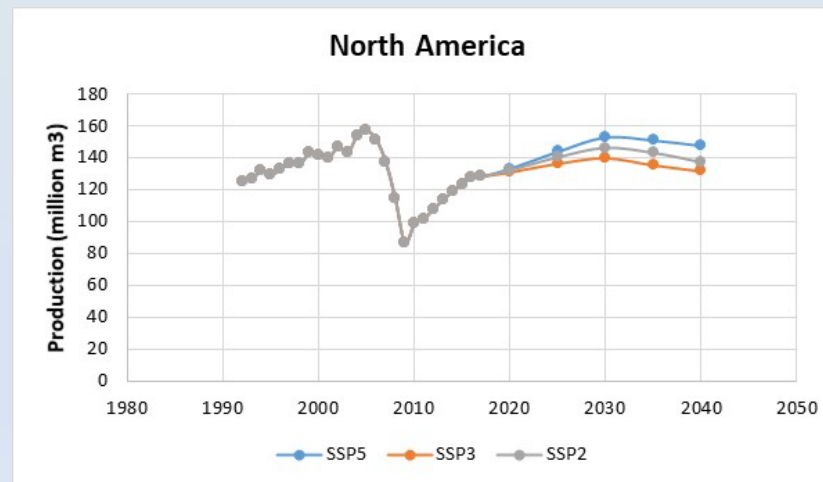
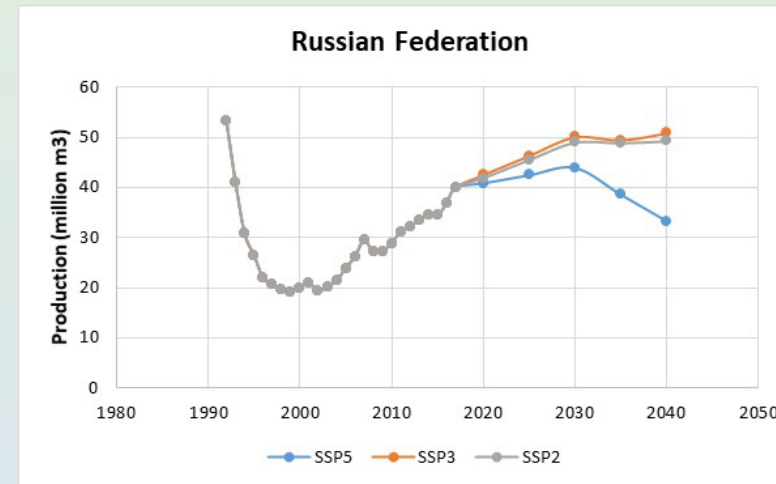
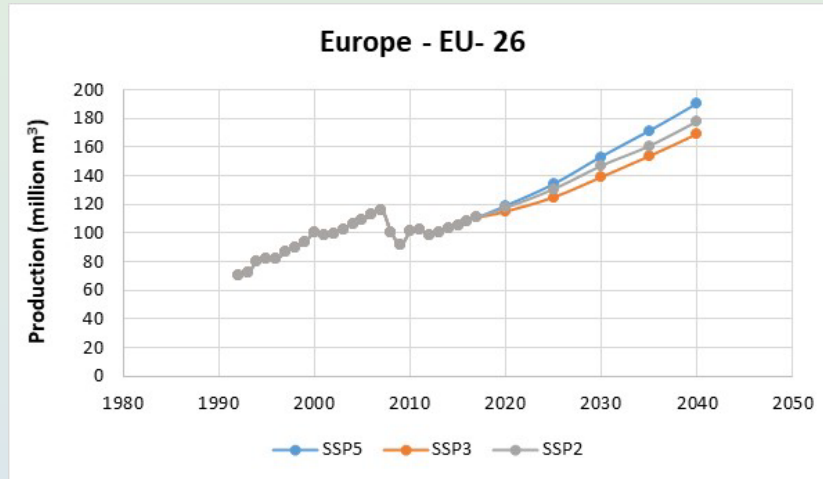
RESULTS: SSPs Planted Forest Area

Historic and projected **planted forest area**, 1990-2040



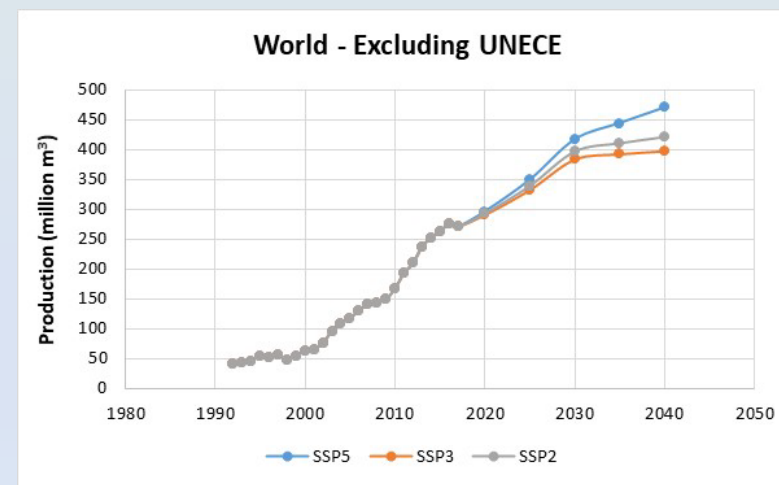
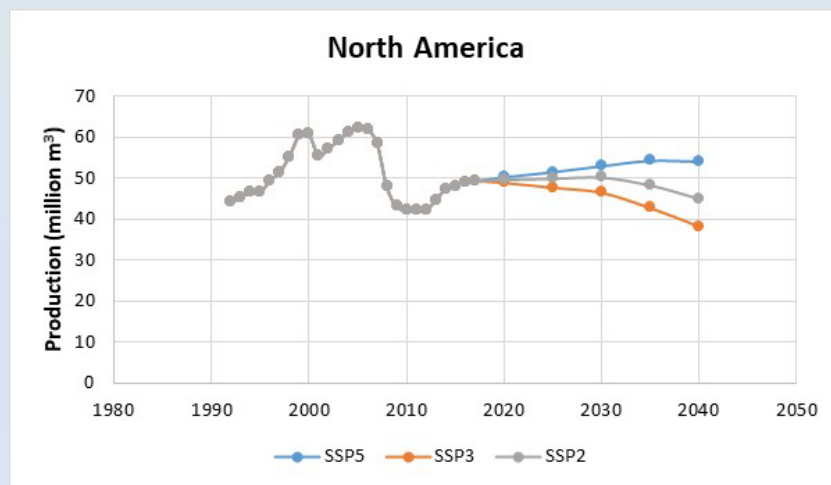
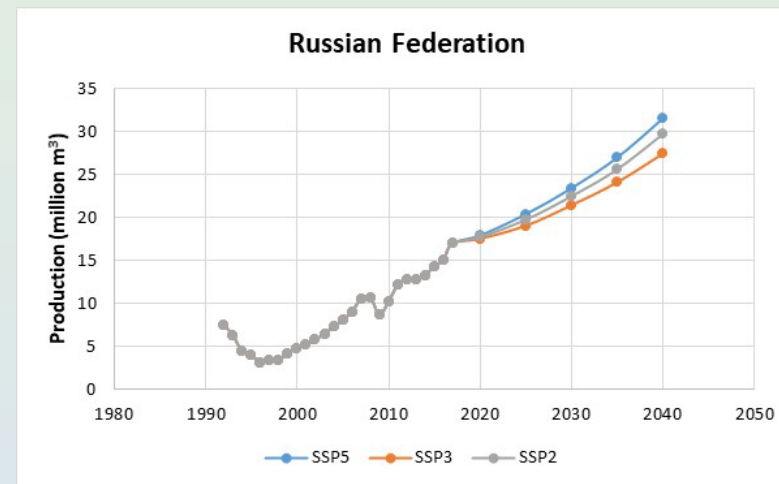
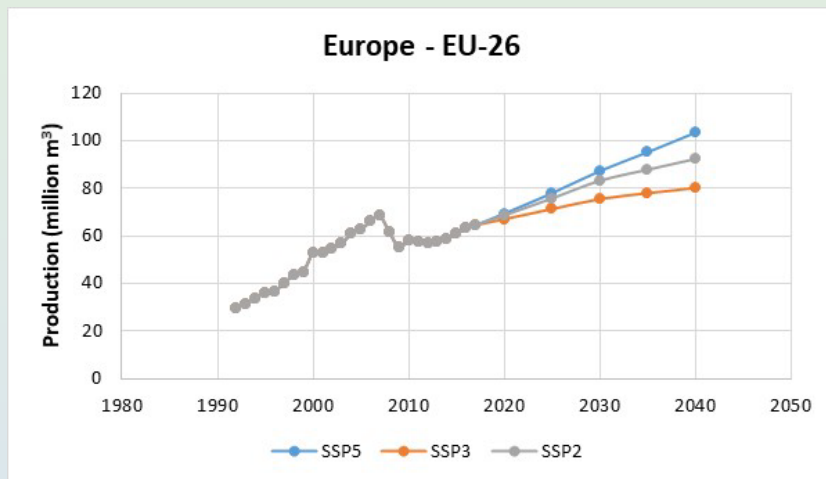
RESULTS: SSPs Sawnwood Production

Historic and projected **sawnwood** production, 1992-2040



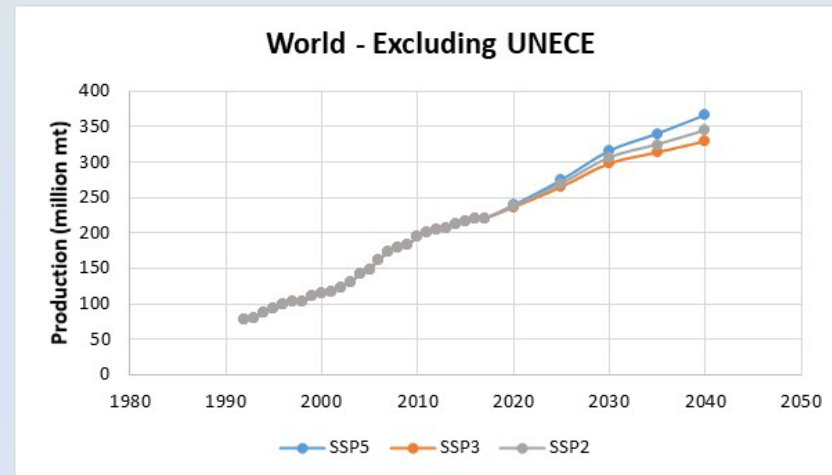
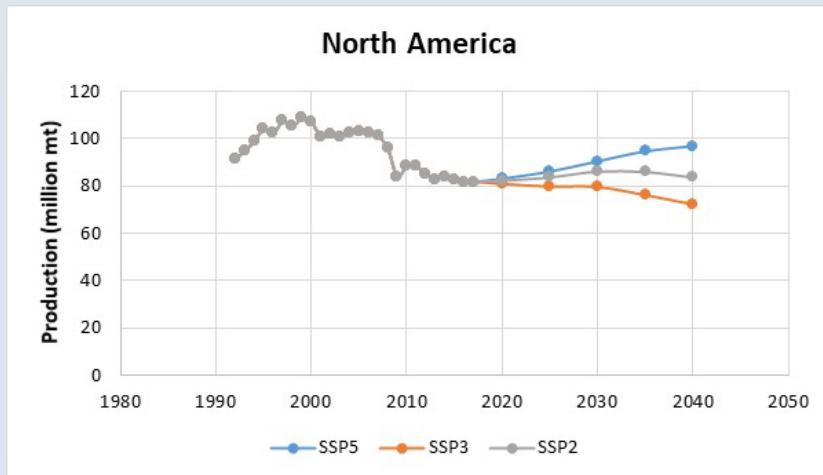
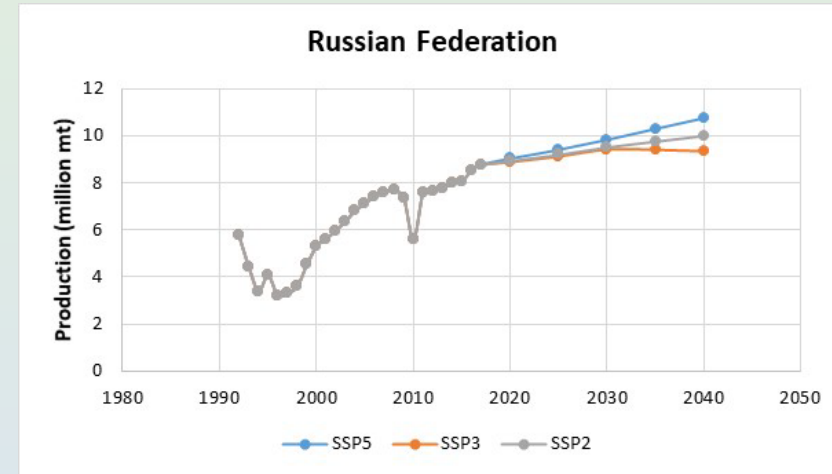
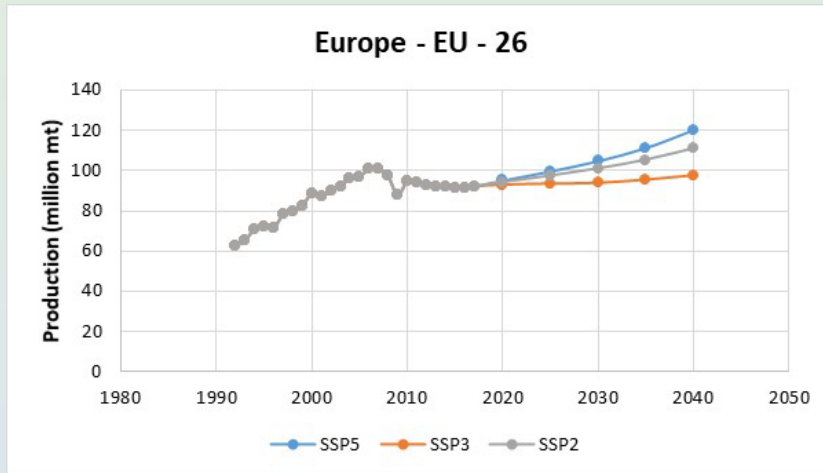
RESULTS: SSPs Panel Production

Historic/projected **panels** (plywood/veneer + particleboard + fiberboard) production, 1992-2040



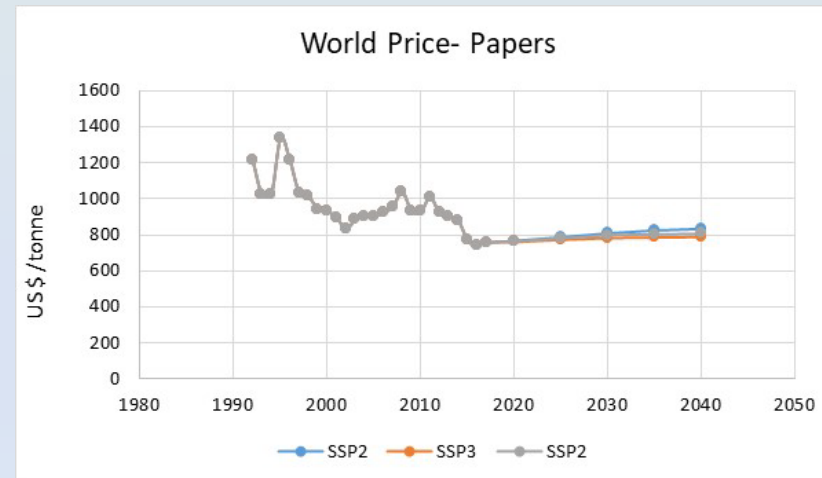
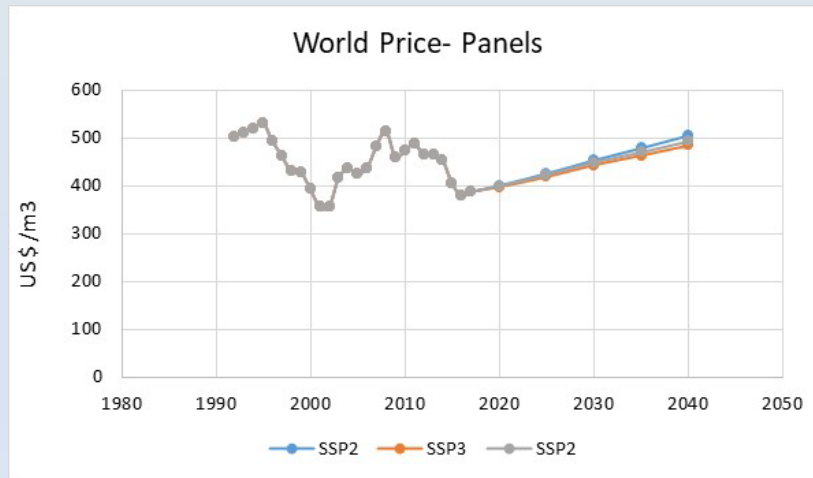
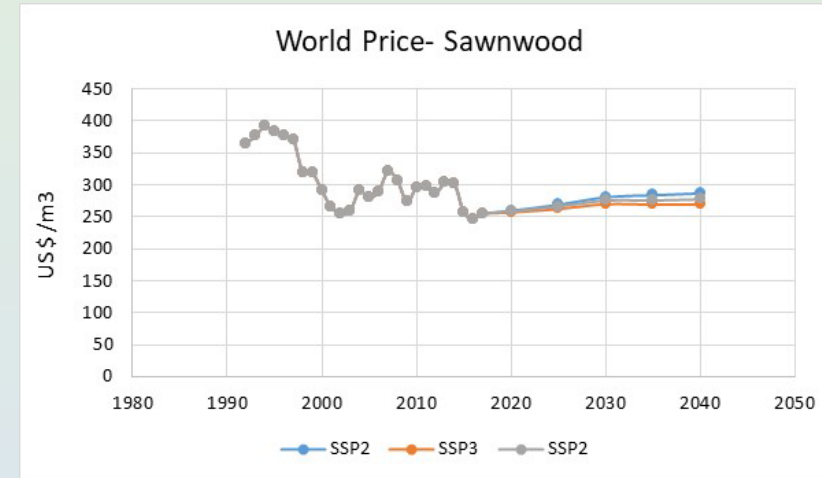
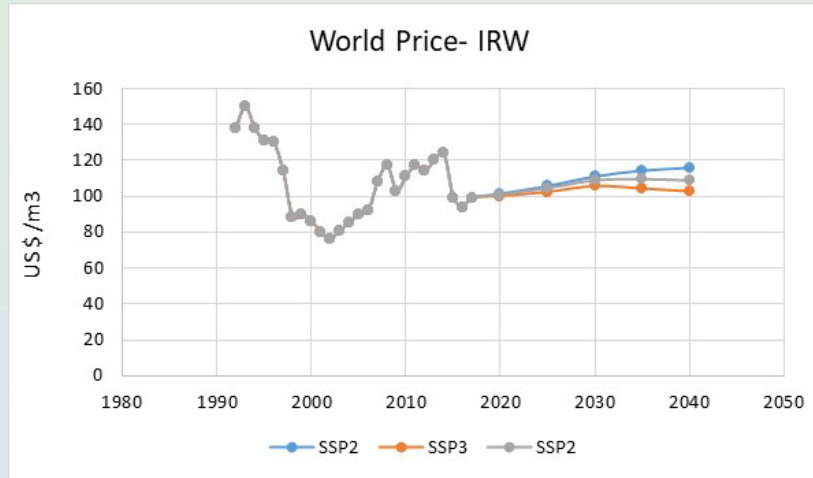
RESULTS: SSPs Paper Production

Historic/projected **Total Paper** production, 1992-2040



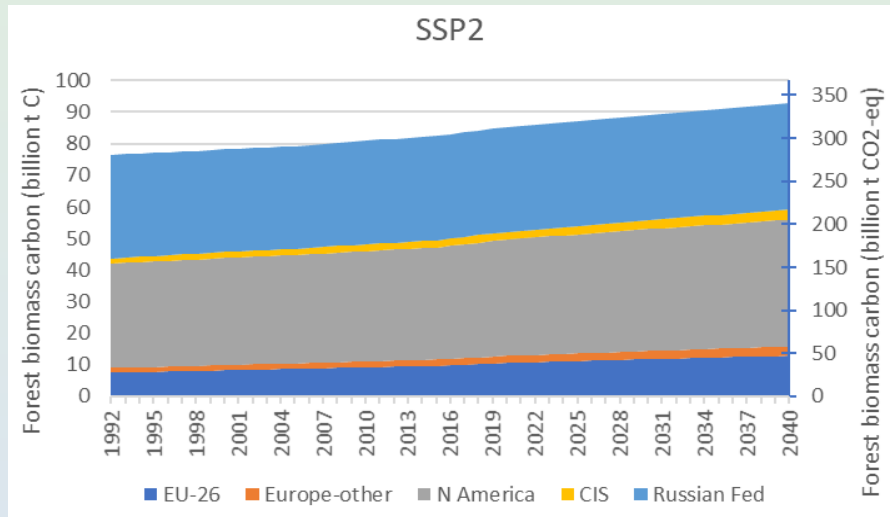
RESULTS: SSPs Prices

Historic/projected Prices, 1992-2040

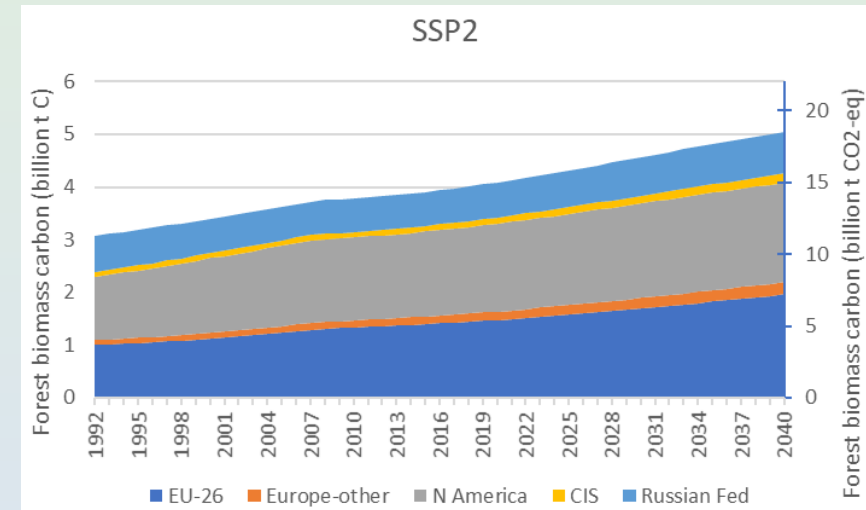


RESULTS: SSPs Carbon

Historic/projected **Carbon Stored**, 1992-2040



Above- and below-ground **forest biomass carbon** stock, 1992-2040



Harvested wood products carbon stock, 1992-2040